good plates prepared from working drawings supplied by makers, but in many cases the figures indicating dimensions are, unfortunately, so small as scarcely to be legible.

An Elementary Class-book of Practical Coal-mining. By T. H. Cockin. Pp. xii+428. (London: Crosby Lockwood and Son, 1904.) Price 4*s.* 6*d.* net.

In general character this useful volume resembles the text-books already available for students of coal-mining. The work is, however, carried to a rather more advanced stage than has hitherto been considered necessary for an elementary class-book, and chapters are given dealing with allied subjects, such as chemistry, mechanics, the steam-engine, and electricity. The order of treatment differs from that usually adopted, the subjects dealt with being:—(1) geology; (2) structure of stratified rocks; (3) coal and coalfields; (4) search for coal; (5) sinking; (6) opening out; (7) miners' tools; (8) explosives; (9) methods of work; (10) working by long wall; (11) methods of working by pillar and stall; (12) special methods of work; (13) timbering; (14) coal cutting by machinery; (15) mechanics; (16) steam; (17) gases; (18) ventilation; (19) instruments; (20) lighting; (21) winding; (22) haulage; (23) pumping; (24) surface arrangements; (25) coke making; (26) accidents; and (27) electricity. This arrangement is not so logical as that adopted by the late Sir C. Le Neve Foster in his elementary work. For example, sinking with rock-drills is described before mining tools, coal-cutting machinery before the elements of mechanics, and electric signals before electric terms are defined. The brief chapter on coke making is hardly necessary, as this subject is usually dealt with in metallurgical treatises. It is doubtful, too, whether the chapters on chemistry, mechanics, steam, and electricity are sufficiently full to give an insight into the allied subjects, for the study of which excellent text-books are available. The illustrations are clear and diagrammatic, and possess the advantage of having been specially drawn for the book.

Bird Notes from the Nile. By Lady William Cecil. Pp. xii+113; illustrated. (London: Archibald Constable and Co., Ltd., 1904.) Price 2*s.* 6*d.* net.

Three claims to high commendation present themselves on the first glance at this elegant little popular work. In the first place, the numerous illustrations are simply exquisite; secondly, technical names are banished from the text; and, thirdly, in the long list of species forming the appendix such names appear to be correctly spelt, and are thoroughly up to date, even to the adoption of the so-called "Scomber scomber" system of alliteration. In her preface Lady William confesses that the notes were written originally solely for her children, who doubtless were desirous of possessing a memento of their parents' Nile trip, but that friends persuaded her to offer them to the public. The adoption of this advice is, in our opinion, fully justified, and while the book has no doubt been found delightful by the young people of the family, it can scarcely fail to be a pleasant companion to the many bird-lovers who make a winter excursion up the Nile. Although no attempt (and very properly) is made at technical descriptions of the various species encountered during the voyage, such notes as are given are in most cases sufficient to render identification an easy matter, to say nothing of the instances when this is rendered self-evident by the illustrations.

R. L.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

Education and National Efficiency in Japan.

The notice of my book "Dai Nippon, the Britain of the East," which appeared in Nature of December 1, directed attention to a nation from which much may be learnt at the present time, and it may interest your readers if I supplement your article by a few notes from my personal experience and observation. In the memorandum issued by Sir Norman Lockyer suggesting the formation of a British Science Guild, it is stated that the people of this country do not manifest that interest in and belief in the power of science which are noticeable among the peoples of the Continent or of America, and that, in spite of the efforts of many years, the scientific spirit essential to all true progress is still too rare, and, indeed, is often sadly lacking in some of those who are responsible for the proper conduct of many of the nation's activities. The British Science Guild has been proposed with the view of attempting to remedy this evil, and to bring home to all classes the necessity of applying scientific treatment to affairs of all kinds.

The objects of such a guild have been attained, to a very remarkable degree, in Japan, not so much by the formation of a special organisation for the purpose, as by the awakening of the national consciousness to the necessity of keeping in mind certain definite aims, and by the earnest cooperation of the various departments of Government, of scientific associations, and of private organisations of many different kinds. There is, indeed, a danger at the present time in this country of too much importance being attached to mere organisation and machinery, and too little to the spirit which pervades them. Mr. Matthew Arnold, in one of his last official reports on elementary schools, pointed out that "our existing popular school was far too little formative and humanising, and that much of it to which administrators point as valuable results is in truth mere machinery." This applies with far greater force to a great deal which has been done in recent years in the way of scientific and technical education. Instruction and knowledge are too often confounded with education, and mere machinery and organisation prevent the development of the scientific spirit. Many of the men who are supposed to have had a complete technical education are very poor specimens of humanity, wanting in individuality and character, devoid of all originality, and with a very narrow view of the world. Some of them may manage to pile up fortunes for themselves, but they will do little to make their country great. Even from a practical point of view, success in any trade or profession does not depend so much on the amount of information which may have been crammed into the learners' heads as is often supposed. It depends incomparably more upon their capacity for useful action than upon their acquirements in knowledge. All experience proves that the spiritual is the parent and first cause of the practical, and especially the economic history of the Middle Ages shows us that an ounce of manly pride and enthusiasm is worth more than a pound of technical skill.

The recent history of Japan has emphasised this fact While attention has been paid to details, the spirit which has animated the leaders of public opinion and action has been the chief cause of the great developments which have taken place. The complete study of this aspect of Japanese national life would take us into many interesting psychological discussions, but it is sufficient for our present purpose to note that the Japanese mind, unlike the British (which is strongly individualistic), is dominated to a very great extent by collective opinion. At the same time, while Japanese philosophy and their former social order were essentially communistic in their nature, still (contradictory as it may seem) their genius is individualistic, and they impress their personal qualities on their work, although they are willing to sacrifice results to a rigid organisation. The outcome of it all is that the national consciousness is

directed to the attainment of national objects by men whose individual powers have been trained to make effective use of western science, and the results have been simply wonderful.

These results have been most apparent in the operations of war. It was the sound of the cannon on the Yalu River, in the war with China ten years ago, which awoke Europe and America to a knowledge of the fact that a new nation had been born in the Far East, and which at the same time started many of the political problems which have led up to the present war with Russia. That war, whatever its ultimate results may be, has shown that the Japanese have not only been able to take full advantage of the applications of western science, but that they have been animated by the spirit of old Japan, which has made them regardless of personal sacrifices. The Army and Navy have been organised and worked on scientific methods, and with a completeness of arrangements which has won for them the admiration of all impartial critics. Their intense patriotism has caused them to perform deeds of daring which are unequalled in the history of war, while their skill in strategy and in the applications of the latest scientific methods to all they have done has made them almost uniformly successful in their operations. They have demonstrated the importance of the work of the engineer. The railways which have been built in Japan have been fully utilised to convey men and materials, and the ships to transport them oversea. The telegraphs have been used to communicate instructions and to keep the authorities informed regarding movements and requirements. The dockyards and shipbuilding yards have been ready to undertake repairs, and the arsenals and machine shops to turn out war material of all kinds, as well as appliances which aid operations in the field. Light railways have been laid down on the way to battlefields, and wireless telegraphy and telephones to convey instructions to soldiers; in short, all the latest applications of mechanical, electrical, and chemical science have been freely and intelligently employed.

The ships of the Japanese Navy are probably the best illustrations of the Japanese methods of procedure. In naval matters they accepted all the guidance the western world could give them, but at the same time they struck out a line of their own, and the fleet which they have created is unique in the character of its units. British designs have in many respects been improved upon, with the result that they have obtained in their latest ships many features which have won the admiration of the naval world. The inventions and improvements which have been made by Japanese officers, engineers, and scientific men disprove the charge which is very often made, that the Japanese have no originality. Even in the matter of pure science Japanese investigators have shown that they are able to take their places among those who have extended the borders of knowledge. The memoirs and papers published by Japanese students and teachers, both on scientific and literary subjects, will bear very favourable comparison with those of any other country, and while no Japanese Newton, Darwin, or Kelvin has yet arisen, there are men connected with Japanese universities and colleges of whom any learned institution in the world would have no reason to be ashamed.

I must refer to my book for details of the developments which have taken place in engineering and industry. Suffice it to say that roads and rivers have been improved, railways to the extent of between four and five thousand miles have been constructed, a large mercantile marine has been created, docks and harbours have been made, telegraphs and telephones are in use all over the country, excellent postal arrangements are in operation, and there are few departments of mechanical and chemical industry in which there are not many establishments doing very efficient work. The result of it all has been that commerce has been immensely extended, and the financial resources of the country developed in such a manner as to enable Japan to take her place among the powerful nations of the world.

At the root of all these developments has been the very complete system of education which has been established in the country. Elementary schools are to be found in every district, and secondary and technical schools in populous centres, while the universities of Tokyo and Kyoto supply the highest training required for the national life; but for details of these I must again refer to my book. The motive underlying all the efforts is what I wish chiefly to emphasise. Shortly after the Emperor succeeded to the throne, he issued a proclamation which contained the following sentence:—"Knowledge and learning shall be sought after throughout the whole world, *in order that the status of the Empire of Japan may be raised ever higher and higher.*" The recent history of Japan is the most striking illustration of the influence of a wisely directed system of education on national affairs when those who are responsible for it are infused with high national ideals.

At the same time it should be noted that some of the most thoughtful and influential men in Japan doubt whether the official system of education is likely to lead to the best results. They feel, like Matthew Arnold, that too often the machinery and organisation receive more attention than the real education, and, moreover, they dislike the idea of all educational institutions being of the same type. Probably the most influential educationist in Japan was Yukichi Fukuzawa, and he never failed to point out the possible evils which are likely to arise from a too strictly official routine. His own college, the Keio Gijuku, has been a great school for statesmen, lawyers, and public men, and many of the leading men in Japan have been his pupils. Count Okuma, the distinguished statesman, has also established what is essentially a private university, and there are many other schools of different kinds, all of which supplement the Government institutions. Even in the technical and professional establishments, however, attention is not confined to the subjects required for strictly utilitarian purposes or for examinations; the first object is to train *men* who will be able to serve their country, in the fullest sense of that term. Many discussions are now being carried on with regard to the future of education in Japan, and the general tendency of these was indicated a short time ago by a distinguished Japanese author when he said, "No system of education which is not based on sociological conditions can be thoroughly successful, and therefore a study of ethnology, sociology, and of evolution generally is absolutely essential to a thorough understanding of the educational questions awaiting solution." The Japanese are now face to face with many problems which confront all industrial nations, and it is to be hoped that, having organised their education generally, and in some respects given an example to western nations, they will go a step further and show that it is possible to combine industrial development with the welfare of all classes of the community.

The chief lessons which the British Science Guild has to learn from Japan is that if it is to be of any real influence in the life of the Empire, the term *science* must be used in its broad sense, as including all knowledge required for individual and collective life, and that all efforts must be guided by a consciousness of the real aims of national life.

Glasgow, December 6. HENRY DYER.

The Heating Effect of the γ Rays from Radium.

IN a recent communication to the *Physikalische Zeitschrift* (No. 18, September) Paschen has described some experiments which indicate that the γ rays from radium supply a large proportion of the total heat emission. It is known that the heating effect of radium when surrounded by an envelope of sufficient thickness to absorb both the α and β rays is about 100 gram calories per hour per gram. Paschen, however, found that if the radium was surrounded by a sufficient amount of lead to absorb completely the γ rays the heating effect was increased 2·26 times. This large heating effect of the γ rays was so unexpected, and of such great importance in connection with the nature of these rays, that we decided to verify this result by an independent method. In Paschen's experiments, the heating effect was determined in a special Bunsen ice calorimeter, in the central tube of which the radium, surrounded by a lead cylinder about 4 cm. in diameter, was placed. In order to correct for the natural melting of the ice mantle a differential method was employed. In our experiments we decided to use a differential air calorimeter, similar to the one described in our previous work on the heating effect of radium and its emanation (*Phil. Mag.*, February). In each flask of the differential air calorimeter